BUFFALO CITY SEWERAGE

AND

SANITARY SCIENCE.

A PAPER READ BEFORE THE HISTORICAL SOCIETY CLUB, JAN. 3, 1866.

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Gentlemen of the Buffalo Historical Society:

The subject of City Sewerage having been assigned me by this Society, I propose to treat it, first, in its historical relations, and second, to make some observations and suggestions upon the general subject of Sanitary Science, of which sewerage is the basis. The subject is one of great importance, in its relations to cities especially, as well as to all aggregations, however small, of habitations for human beings. Nature is continually passing through a process of dissolution and regeneration. The products of each year are consumed, forming the animal life of the current year, while those portions which nature rejects, or is sloughed off in the process, are the active elements in the next year's re-production. It is one of the paramount necessities of civilization to regulate these fixed operations of nature in such manner as to restore to the earth, as the great original producing power, every element of future production; while, at the same time, the matter which will inevitably accumulate shall be disposed of in a manner as little offensive as possible to the human family. A failure to do this, will sooner or later bring upon the community discomfort and disease, corresponding with neglect and inattention to natural laws.

Cleanliness of person and habitation is one of the first as well as the highest attributes of physical civilization. The inexorable laws of nature must be obeyed, and while the savage regards it scarcely more than the beasts of the field, his advances in civilization may always be measured by his increasing regard for the decencies of life. As population advances and gradually acquires fixed habitations, these necessities become more pressing, and conveniences are created to meet its requirements. The tendency of all mankind to gather into communities and create what finally becomes large cities, brings with it the necessity for disposing of the inevitable accumulations of rejected matter.

The ruins of every ancient city show upon investigation, that a large element of its construction is that which pertains to the disposal of rejected matter and offal

of the city. While it is not a subject which finds a place in the dignified pages of history—except in casual allusions to stupendous structures for water-supply or roadways—the vast underground work, for their drainage, have scarcely attracted the attention they deserve. It is a fact that the under ground work in all great cities, ancient and modern, has been one of the greatest of their local works, and that the cleanliness and consequent health of every large city, is just in proportion to the completeness of its under ground drainage and water-supply. Large cities in our own country are comparatively modern. It is only within the present century, that they have approached the proportions of the cities of the old world. They have also been built too rapidly, and by a population too much engrossed in the pressing requirements of life, to give much attention to those improvements which posterity were to be the principal recipients. Sewerage, therefore, on any large scale, was substantially unknown, and water works on any scale adequate for general and individual supply, were rarely attempted until within the present century.

With these preliminary remarks, I proceed to the subject of City Sewerage, which comes within the class of subjects which may properly form a paper for this Society.

Previous to 1847 the subject of underground drainage had attracted little attention. A stone sewer had been constructed in Seneca street, east of Ellicott, and also one of a similar character in Swan street, both draining into a small sewer in Michigan street, which connected with the Little Buffalo Creek. These sewers—or drains, as they were called—answered a very good purpose for the time, doing excellent service to the property upon their lines.

In 1834-5 some attention was given to the subject, and sewers were constructed in Ellicott and Oak streets, but of a very inferior character. They were but five or six feet deep, constructed of dry brick, with a board bottom, the bricks laid up projecting inward till they met at the top, and held in place as soon as laid, by the soil thrown upon them. Even these wretched sewers did good service for many years, but have long since been displaced by sewers of modern construction.

In 1847, under the mayoralty of the Hon. E. G. Spaulding, the progress of local improvement had been such, that special attention was drawn to the subject of sewerage, and on the formation of the committees of the Board of Aldermen, a new one was created called the "Committee on Paving, Sewers and Lights." This committee consisted of O. G. Steele, Orlando Allen and Luman K. Plimpton. Although a new committee, it proved to be the most important of the year. The call for paving was pressing, city lights there were none, and sewerage was so little known as to be scarcely recognized among city improvements.

There was, therefore, abundant work for the committee. Paving on a large scale was commenced that year. Public lamps were erected on Main street—oil lamps—so insufficient as to be a constant source of ridicule for the local editors; and the first great receiving sewer in Michigan street, from the Canal to Batavia street, was constructed.

This great sewer, the first proposed by the committee, has now been constructed over 18 years, and has never failed in any essential particular. Its cost at that time was considered enormous, and it was vigorously opposed by many of the property holders of the district proposed to be taxed. Its construction involved many important questions. First, its great expense. No sewer or drain ever before constructed, had cost but a few hundred dollars, while the tax proposed for this sewer was $12,500; a sum unprecedented in such improvements. The *principle* of taxation was also an important question, it being the first receiving sewer proposed under the city government. The few sewers previously constructed, had proposed to drain only the street and lots in which they were laid. The new system proposed to tax for an ordinary sewer only, and all other territory proposed

to be drained by it, a certain proportion for the privilege of outlet for its lateral sewers. This principle, which was then established, and its equity now universally admitted, was fiercely contested, and it required the earnest and united action, as well as persistent effort of the committee to obtain a confirmation of the assessment roll. Several minor sewers were ordered during the season of 1847, and on the 15th February, 1848, the committee submitted a report recommending a general system of sewerage. This report contemplated so large an expenditure as to alarm somewhat our property holders, and was not adopted. It was, however, ordered published in the proceedings of the Council at an expense not exceeding *five dollars*, and placed on file.

This report, upon which our whole system of sewerage is based, has since been carried out by the City Government, and has proved eminently successful. I would beg to read it at this time, as the shortest way of informing you of its general plan.

REPORT.

The Committee on Sewers, to whom was referred the subject of preparing and submitting to the Council a system of sewerage, which will embrace a systematic under ground drainage for the city, would respectfully report:

That they have given the subject the consideration which its importance demands, and would submit for your consideration the following plan for the principal sewers, which it is believed will, with a proper construction of lateral sewers, furnish a complete drainage for all those portions of the city which are now built up, or which probably will be for a considerable period.

The importance of a complete system of under ground drainage, seems not to have been sufficiently appreciated by our citizens; and until the past season no sewer has been constructed with a due regard to the requirements of the city, as well in the extent of their lines, or the mode of construction. Sewers were constructed many years since in Washington, Swan, and Seneca streets, and also in Ellicott and Oak streets, which notwithstanding the defective manner in which they were constructed, have been of great service to the streets in which they were located.

It is, however, unfortunate that these sewers were not of a greater size, and more substantially built, there being already a great necessity for their reconstruction, and which must inevitably be done within a very few years. The great convenience which has been derived from these sewers has satisfied the owners of property in regard to their utility, and has done its work in preparing the public mind for a complete system of sewers, which will embrace the entire settled parts of the city, and provide outlets for such other portions as will hereafter require the same advantages.

In the establishment of this system of sewerage, the city must rely for the general cleanliness of the public streets, as well as the means of providing every dwelling house with an outlet for its surplus water, and all substances which unless carried off by some under ground medium, must operate injuriously upon the public health. This public advantage, together with the extreme comfort to private families, arising from the facility of disposing of all the surplusage which necessarily arises from domestic avocations, will at once commend itself to all, as one of the most important improvements, both in a public and domestic view, which has ever been entered into by the city.

Most of the large cities in this country have already adopted to a greater or less extent, a system of under ground drainage, and it is a settled fact, that those cities which have adopted it the most extensively, are in the enjoyment of the greatest degree of cleanliness, and consequently of public health. The city of New York has heretofore been the most deficient in this particular, and this neglect has been occasioned by the peculiar nature of the soil upon which the city stands, which is composed of sand and gravel, very porous, and into which all substances of a fluid nature, are easily absorbed. For this reason sewers on the scale necessary in most other cities have heretofore been deemed an unnecessary expense. It has however been found by experience that this natural advantage is not sufficient for the enormously increasing necessity for under ground drainage, which has been created by the density of the population. The great variety of avocations carried on in all large cities, which in many instances create intolerable nuisances, can only be tolerated, by the facility afforded by the construction of large public sewers, accessible from all portions of the city, and sufficiently capacious for all manufacturing and domestic purposes. This necessity has been pressed upon the city of New York, and the Common Council are now actively engaged in providing for the entire city, and at an enormous expense, the necessary sewers for its accommodation. That this great expenditure is fully justified by the necessities of the case, has been made clearly

manifest to the city authorities; and is generally concurred in, and the expense cheerfully borne by the property holders of that city. No subject of local improvement involving so large an expenditure has ever been adopted in that city, which has commanded so entirely, the approval of its inhabitants. The cleanliness and general health of the city of Philadelphia, is owing in a very great degree, to its very complete system of sewerage, adopted at an early day and systematically continued. All the other large cities in the Union, so far as your committee possess any knowledge, are provided with public sewerage to a degree corresponding with their necessities, and which is gradually becoming more perfect, as its great necessity on the score of public health, cleanliness and domestic comfort, has become properly understood.

No city within the knowledge of your committee has carried the system of sewerage to such a degree of completeness, both in a public and private application, as the city of London.

The sewers are of the largest dimensions, when required for conductors, and the most perfect connection with all parts of the city, by means of lateral sewers. So perfect is the combination and connection of this system of sewerage, that every building or tenement has access to their subterraneous passages,—thus enabling every family to dispose of every drop of surplus fluid created by domestic necessities, The importance of this system to a city so densely populated as London, where so large a portion of the city is occupied by the lower classes of people, compelled to crowd into the smallest possible space compatible with mere existence, and where the unavoidable nuisances created by such a system must breed pestilence, is easily imagined. So necessary has it been found for the preservation of the health and cleanliness of the city, that it has been long established by law, that every tenement shall have a drain connected with the public sewers, sufficiently large to convey off every particle of domestic surplusage.

The system of sewerage in Paris is also on an extensive scale, accomplishing the same objects as that of the city of London, and subject to similar municipal control and supervision. It is, therefore, an established necessity in all large cities that a system of under ground drainage should be established and maintained. In the consideration of the subject of a general system of sewerage for this city, your committee have in the first place endeavored to establish the great lines of receiving sewers, which will be sufficiently capacious to receive all the lateral sewers, which it may be necessary to discharge into them, With this object in view, your committee would respectfully submit for the consideration of the Council, the following, as the lines of principal receiving sewers, which it is necessary, in their opinion, should be adopted by the Common Council, at the earliest practicable period.

1st. A sewer through Michigan street, from the Erie Canal to Carlton street. This sewer is now completed as far as Batavia street, and is under contract to Genesee street. It is built of hard brick, 4½ feet in the clear, and of a circular form, which is deemed the best mode of construction for sewers of every description. From Genesee to Goodell street, for the construction of which, there is now a strong application before the Council, it will not be necessary for the sewer to exceed half the size of the sewer below Genesee street, and from Goodell to Carlton street, a sewer 2 feet in the clear, will doubtless be sufficiently large to accommodate the section of territory draining into it.

2d. A sewer in Delaware street from a point in the vicinity of the Johnson house, to Genesee street, and from thence to the Erie Canal. A portion of this sewer north of Mohawk street, is now in process of construction. From Mohawk street it should be sunk at least ten feet below the surface, and 3 feet in diameter to Genesee street. From thence to the Erie Canal, the size should be increased to 4 or 4½ feet. This sewer will receive all the drainage of Delaware, Franklin and Pearl streets, and also Genesee, Court and Niagara streets, centering at the Public Square, and in all of which streets, sewers must eventually be constructed.

3d. A sewer in the eastern part of the Second and Fourth Wards, in the streets nearest the general course, and receiving the water of the "Big Ravine," so called. This sewer should commence as high up as Genesee street, and continue to the Little Buffalo Creek, and should be of a capacity sufficiently large to receive the large amount of water which naturally flows in that channel, as well as the additional drainage which will accrue from the large and increasing population in that part of the city.

The necessity for the construction of this sewer is by no means pressing; several years will doubtless elapse before it will be required by the owners of property in that region; but your committee believe that its necessity is apparent, and that its ultimate construction should be recognized and determined upon, that the improvements in that part of the city may be made with reference to its final completion.

4th. A sewer commencing at or near the intersection of Delaware and Virginia streets, following the general course of the ravine or water course in the rear of the old Johnson place, to the Erie Canal.

From the broken and unfavorable nature of the ground in this section, it will be impossible to carry this sewer through streets, or to divert it in any manner from its present channel. It will, therefore, be only necessary to recognize this channel as one of the great lines of public sewers, and construct in the streets intersected by its channel, substantial stone culverts across their entire width.

The ravine being an established water course, cannot be obstructed by any of the owners of property on its line, and they will therefore be compelled either to leave it open, as it is at present, or to culvert it, in a manner corresponding with the street culverts.

These four lines of receiving sewers, will in the opinion of your committee, provide for the entire drainage of the city, for a long period, and perpetually within the limits embraced by their two extremes. Other sewers may be required north and west of the last mentioned line, should it be deemed necessary by the increase of population, but the number proposed, is sufficient to provide for all the prospective wants of the city, which should properly come within the cognizance of the present legislation.

There are also some sewers of minor extent, but which it will be necessary to construct independently of those indicated, and which should be constructed at as early a day as practicable. Among these, is one in Erie street, from South Division street, to the Erie Canal, and which should receive a lateral sewer from west Swan and Seneca streets. Also a sewer in Court street from the Erie Canal to Morgan street, and thence through Morgan street to Mohawk street, receiving the water of the sewers in Mohawk and Niagara streets, which center at that point. This last named sewer will receive the water flowing across the land from Niagara street to the canal, thus enabling its owners to fill up and improve it as they may desire.

It may appear on a cursory view of this subject, that the amount of improvement proposed by the foregoing system, is too extensive for the necessities of the city, and may startle property holders by its expense. It must be borne in mind however, that a large portion of the improvements contemplated, are not of immediate necessity, and will require many years for their completion. The main object of your committee is to lay the foundation of a complete sewerage system, which will eventually embrace all portions of the city, the execution of which will devolve upon successive councils, who will order the work as it may be required and applied for, by various sections of the city; but which should all be executed with reference to a general and established plan.

In furtherance of the plan herewith submitted, it will be necessary that accurate surveys should be made of the lines of receiving sewers proposed, and a map of each line, with the proper levels and grades entered upon it, prepared and deposited in the office of the Street Commissioner.

A general Sewerage map should also be prepared, which will exhibit the line of sewers, already constructed, with the location of the several openings and inlets, and from which the proper direction and grade of future sewers, connecting with the main lines, or the Erie Canal, can at all times be ascertained.

Your committee would therefore beg leave to offer the following resolution:

Resolved, That the City Surveyor be directed to prepare a general sewerage map of the city, which will exhibit all the lines of sewers already constructed, with their grades, openings and inlets, as far as can be ascertained; and upon which map, shall be entered all sewers which may hereafter be constructed by order of the city, with their grades, openings and inlets, and such other information as may be necessary to place the city authorities in full possession of the facts necessary to establish a complete system of sewerage. Adopted.

O. G. STEELE,
O. ALLEN,
L. K. PLIMPTON,
Committee on Sewers.

February 15, 1848.

It will be seen that the Report embraced the territory from Carolina street on the west, to the Big Ravine, as it was termed, in the old Fourth Ward, near Spring and Pratt streets and northerly as far as Goodell and Virginia streets, then substantially the limit of population.

All the receiving sewers named in the Report, were constructed in a few years, including the proposed large Sewer in the Big Ravine before referred to—which was mainly by the efforts of S. V. R. Watson, Esq.,—and the sewer through the great ravine in the rear of the old Johnson Place, near the Buffalo Female Academy, and passing between Georgia and Carolina streets to the canal.

The success of the Michigan street Sewer was so decided as to settle the whole question as to the utility and policy of large receiving sewers. Previous to its construction, that part of the city, above Eagle street, was destitute of any system of drainage. All the water which fell upon the surface, remained until taken up by evaporation. No cellar or vault could be made available, as the first hard rain would fill them with water, and no means existed to carry it off. The sewer remedied all this. It was built circular in form, 4½ feet diameter, and sunk 10

feet below the grade, thereby fully meeting every requirement of the large territory proposed to be drained, and changing in a very few years, the whole character of that portion of the city. As fast as the sewer was completed, connections were made with it from the buildings on the street, and lateral sewers were speedily constructed in the cross streets. It is but just to say that as its value developed itself, all serious opposition ceased, and the whole territory was in a few years thoroughly drained. Large receiving sewers outside of the limits referred to, have since been constructed, and one of the largest in the city, known as the Emslie street Sewer, built in the easterly part of the city—through the territory known as the Watson purchase, and other property outside of the city limits—has brought that large and almost deserted territory into use for building purposes. Nearly every street in the old city limits, is now provided with a sewer, and the city from being the worst, has become one of the best drained cities in the United States. It is mainly to this system of sewering that we are indebted for the reputation, which seems now to be established, of being one of the healthiest cities in the State.

Such is briefly the history of the origin and progress of our system of sewerage. I propose now to submit some observations upon the general subject of sanitary science, of which sewerage is the foundation, and as applicable to this city.

The primary object and direct effect of sewerage was to drain the territory of its surface water, and receive the refuse water of the houses bordering upon the lines of sewers. A broader and more effective attribute was given them after the introduction of water by the Water Works Company in 1852. The general introduction of water into our dwellings, stores and manufactories, was made effective and complete by the facility of draining off the surplusage of mechanical avocations and domestic necessities. Our habitations soon became fitted up with bathing rooms, water-closets, and all those household improvements which have been brought to such great perfection by the art of plumbing, while out-houses and sinks of every description, which become so great a nuisance as population becomes dense, have nearly disappeared from the center of the city.

These great changes in the character of our city in this respect have come upon us so gradually as to be almost imperceptible, and yet nothing in the way of local improvement has been more important, or productive of greater benefits. The two great elements of sewerage and water supply, have insured to us the means of perpetual provision against local nuisances of every description, and the under ground conveyance to the river of every domestic or manufacturing residuum which may affect unfavorably the health of the city and the comfort of our citizens. Let any citizen of twenty years' standing contrast his present household arrangements with those of the best class of houses previous to 1848. Houses which then ranked as first-class would now be considered almost untenantable.

With what sort of grace would the lady head of any of our first-class houses, with the modern necessities of gas, water supply, heating apparatus, and all the innumerable conveniences from kitchen to parlor now so universal, submit to the first-class house of twenty years ago?

And yet, while we have much to congratulate ourselves in our public and private improvements during the last twenty years, there is still much to be done; and we are far from perfection in sanitary science. While our sewerage is very complete, the street inlets are too infrequent, and few of them are provided with proper stench-traps. This should be universal, as the often-times noxious effluvia from exposed sewers is one of our greatest dangers. Even our houses are some of them unprotected in this respect, and this is one of the sources of disease against which we should be carefully guarded.

The threatened reappearance of the cholera among us the coming season—the first appearance of which in this city, in 1832, was so graphically portrayed by

Mr. Allen at our last meeting—admonishes us that too much precaution cannot be taken to prevent, if possible, and modify in any event, the ravages of this terrible disease. Every family should look to it that their sewer connections and water supply are complete, and that every generating element of disease is removed from the premises or adjacent streets. Vacant lots should be examined, and all collections of surface water, or discharges from buildings or factories of any kind, should be thoroughly suppressed or conducted quietly to the sewers. The sewers themselves should be frequently flushed with water, and the street gutters kept clean by frequent washings, in warm weather. To effect all this, a more full and diffused water supply appears to be indispensable.

Nothing conduces more to the comfort and the health of a city, than an abundant supply of water. It should not only be abundant, but if possible, profuse; and if the present means of supply are inadequate, steps should be taken at once to increase the supply, and render its distribution more complete and universal. We cannot overrate the importance of this great sanitary element, and with an abundant supply, and a judicious use of it, with our system of underdrainage, we may consider ourselves well fortified against any ordinary pestilence. Our Health Physician should be a well educated and scientific man, who thoroughly understands the principles of Sanitary Science, and who can and will give special attention to the duties of his office. Our Board of Health should be men of character, and some special adaptedness to the position, and the Health Inspectors, whose duty it is to keep watch and guard over the sanitary condition of the city, should be men of intelligence, faithfulness and independence. They should be able to detect all latent causes of disease, and apply the remedy with promptness and impartiality.

Elements of disease frequently arise from unexpected quarters, but always from some violation of sanitary laws. I have recently read somewhere an account of a pestilence at a Young Ladies' Seminary, I think at Pittsfield, Mass., one of the healthiest districts of New England, and the institution admirably situated in this respect. Yet a form of typhoid fever prevailed to such an extent that the school was broken up. The cause was a mystery for some time, and it was finally discovered that a sewer had been choked up to such an extent as to prevent a proper discharge, and the effluvia thus created was the cause of the disease. This example illustrated the necessity of great care in respect to drainage in general, as well as a more perfect knowledge of sanitary science.

It is well, however, to understand that all disagreeable odors are not necessarily unhealthy. Such is the case with tanneries, soap manufactories, horse stables, foundries, &c., and I may add gas works. None of them are desirable for next door neighbors, but still do not produce any element of disease. I mention these simply to show that while the best regulated houses and neighborhoods may from no apparent cause become unhealthy, other localities, seemingly much more exposed, may be exempt. It is quite evident that sanitary science is imperfectly understood, and that a higher education in that respect should be required in the selection of men with whom may be entrusted the responsibility of the health of a large city.

I would here take occasion to allude to a department connected with this general subject, which should receive more attention than has heretofore been given to it, and that is the burial of our dead.

Within twenty years past great improvements have been made in this respect. Burial grounds, and interments in tombs and vaults in cities, have been prohibited, and large cemeteries have been provided contiguous to, but removed from, the great centers of population. These grounds have been improved with reference to monumental ornaments, the park-like arrangement of the grounds, and the cultiva-

tion of appropriate shrubbery. Our burial places, instead of being shunned and neglected by the living, are becoming, and in many cities have become, the most beautiful and attractive resorts for our population. All this is creditable to those who have provided these beautiful resting places for the dead, and should be encouraged by all.

But science teaches that the prevailing idea of carefully preserving the body from decay is erroneous, and that the object of interment should be rather to expedite than retard decay.

I am conscious that this is a subject which should be treated with delicacy, but it is one which should command attention from the living, in a sanitary point of view. The law of God and of Nature commands that the body shall return to the earth from whence it came, and the spirit to God who gave it. This law is inexorable in all its requirements, and all efforts prompted by love and affection for deceased friends for the preservation of their bodies, can produce but temporary delay.

When the spirit departs from the body all are on a common level. The king has no element more sacred than the slave, nor the rich and distinguished over the poor and unknown, It may well be questioned whether all our efforts for preserving the body by depositing in vaults or tombs, metal coffins, stone or brick cases, are not injurious to the living as well as useless for the purpose intended. I am aware that this subject is one of feeling and sentiment, and that all civilized people have their own customs and prejudices in regard to the disposition of their dead. But science and the experience of past ages admonishes us that we should meet this subject as we should all others which form a part, and a most important one of our duties as members of a civilized and Christian community.

I hope the subject may be treated by some of our medical men of science, and correct ideas and customs may be brought forward for our consideration.

I would beg to say before concluding this somewhat desultory paper, that I have nothing of what may be termed scientific knowledge on this subject of sanitary science, but having been connected with various movements and institutions where the subject has been much considered, I have thrown together these suggestions with the hope that some of our members of the medical profession, may be induced to take it up, and treat in a thorough and scientific manner.